

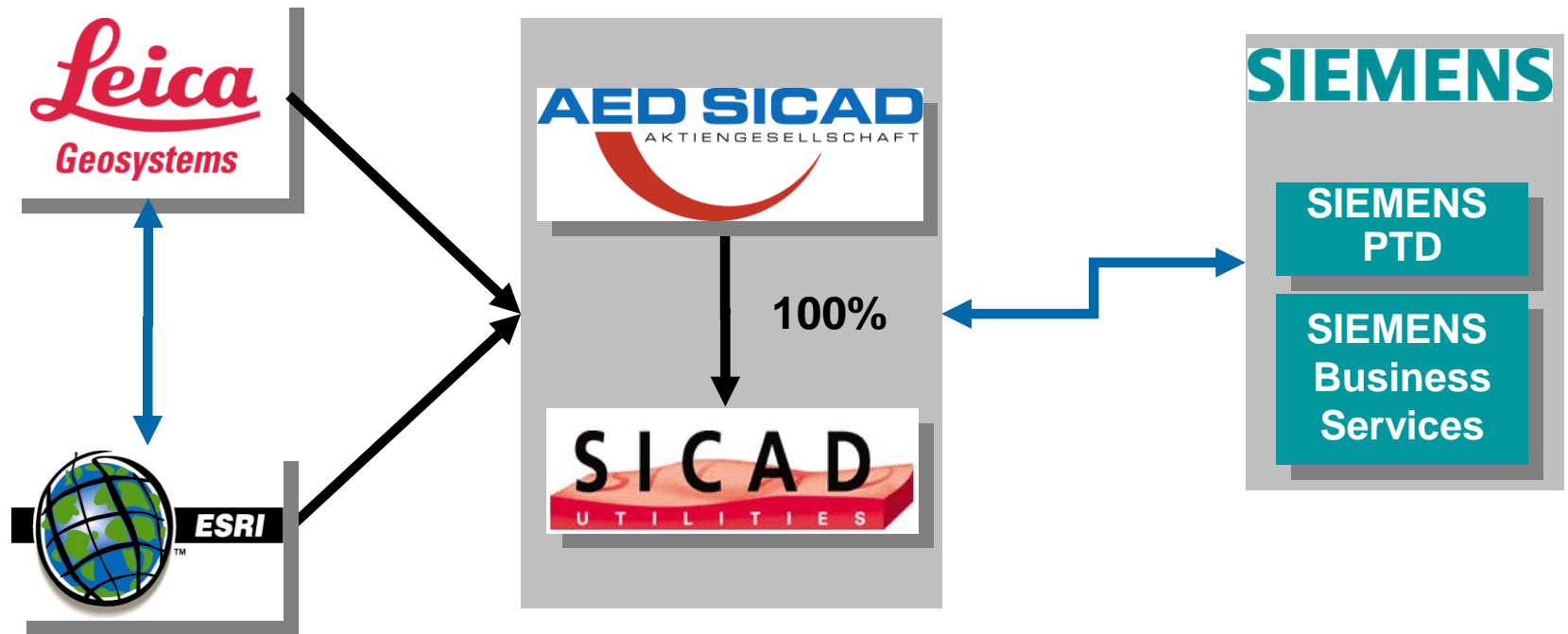
# ISO 19100 Series Standards in a Model Driven Architecture for Landmanagement



Jürgen Ebbinghaus, AED-SICAD

29.10.2003

# The Company



- ➔ Shareholder & Strategic Business Partner
- ➔ Strategic Business Partner

## The Company

### ■ Largest GIS application company in Europe

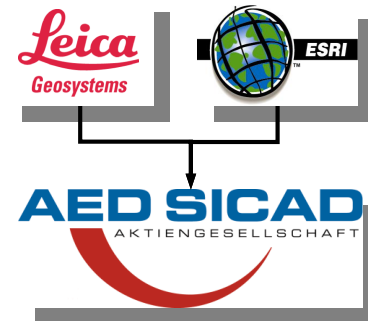
- ✦ Approx. 250 people
- ✦ More than 10000 licenses and >2000 customers all over the world
- ✦ 80% of the German Cadaster market and many large Intl. cadastre agencies use AED-SICAD technology

### ■ Our offering

- ✦ State-of-the-art GIS applications for landmangement / cadastre and utilities
- ✦ Consulting services for cadastre and utility projects

### ■ More than 20 years of experience

- ✦ GIS and GIS Application development
- ✦ Large infrastructure project management
- ✦ Cadastre Information System implementation

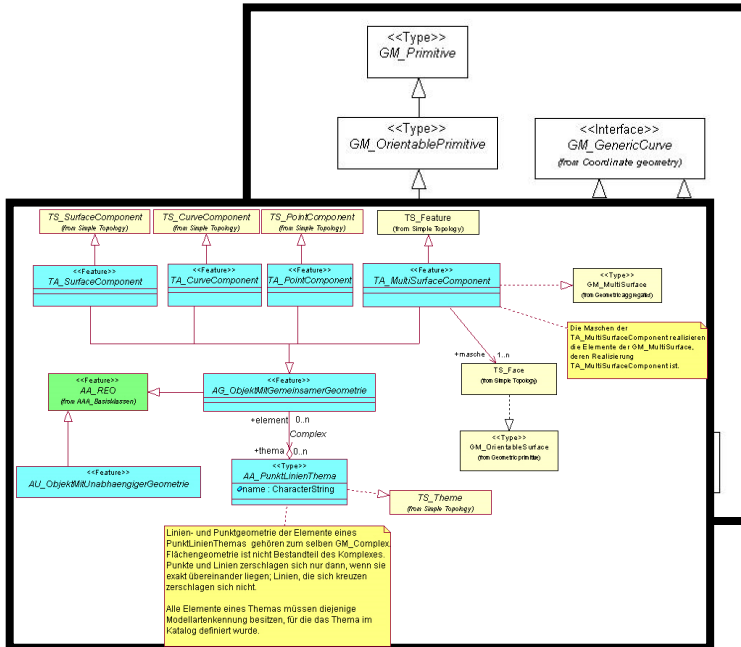


## ISO 19100 Series Standards used / observed in Design and Implementation

- **19103 Conceptual Schema Language**
- **19106 Profiles**
- **19107 Spatial Schema**
- **19109 Rules for Application Schema**
- **19110 Methodology for Feature Cataloguing**
- **19111 Spatial Referencing by Coordinates**
- **19115 Metadata**
- **19118 Encoding**
- **19119 Services**
  
- **19128 Web Map Server Interface**
- **19136 Geographic information - Geography Markup Language**
- **19139 Metadata – Implementation Specification**
  
- **OGC Web Feature Server 1.0**
- **OGC Filter Encoding 1.0**

# Model Driven Architecture based on AFIS®-ALKIS®-ATKIS® Standard I

## ISO Harmonized UML Model

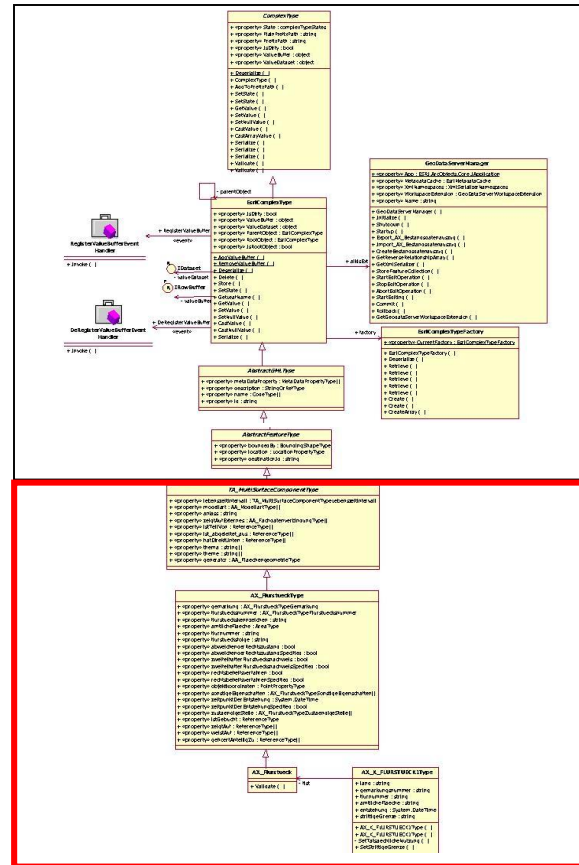


## AFIS®-ALKIS®-ATKIS® UML Model

Rose Script

XML Schema Definitions (XSD)

XML Application Metadata <appinfo/>



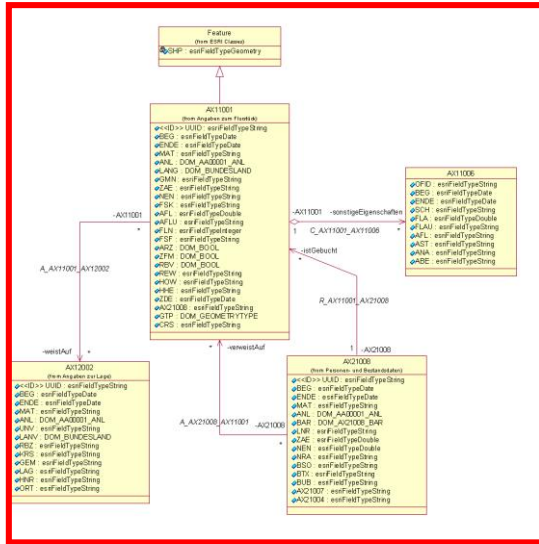
Application Framework

XML Class Generator

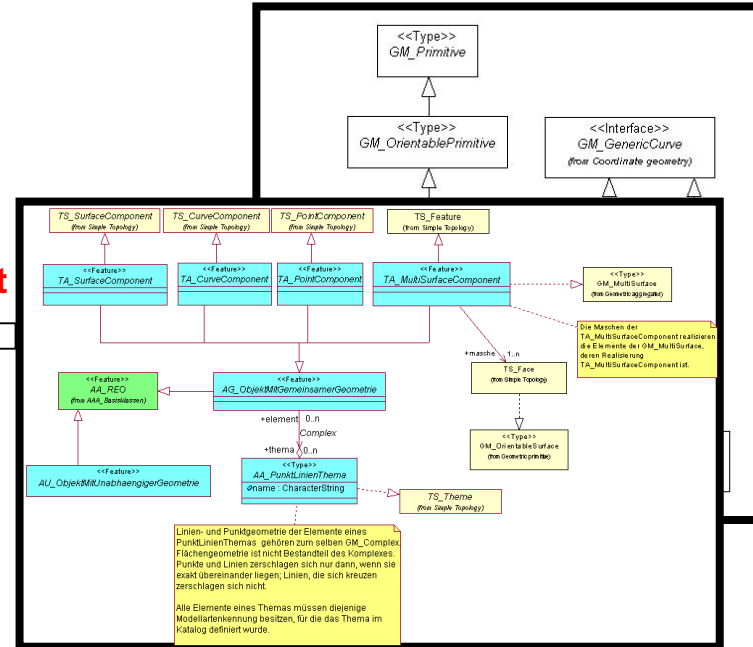
Feature API

# Model Driven Architecture based on AFIS®-ALKIS®-ATKIS® Standard II

## ArcGIS Geodatabase UML Model



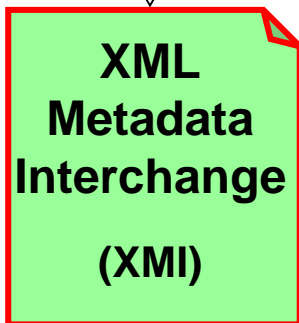
## ISO Harmonized UML Model



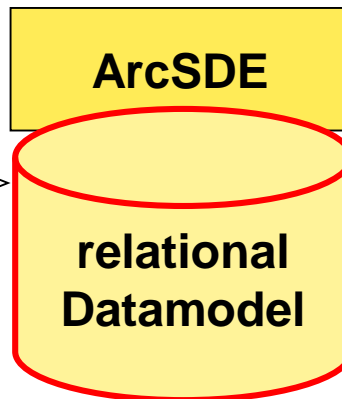
Rose Script

UNISYS XMI  
Export Tool

AFIS®-ALKIS®-ATKIS® UML Model

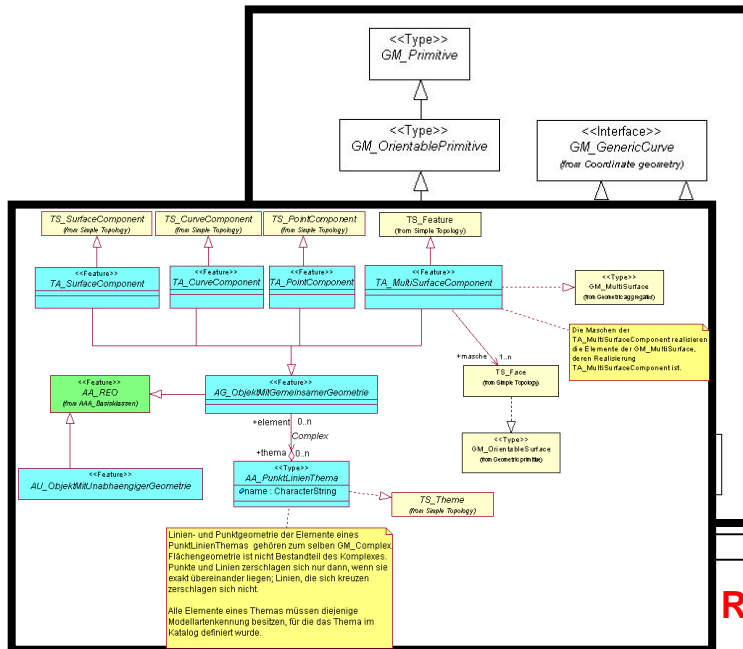


ESRI CASE  
Schema  
Wizard



# Model Driven Architecture based on AFIS®-ALKIS®-ATKIS® Standard III

## ISO Harmonized UML Model



## AFIS®-ALKIS®-ATKIS® UML Model

Rose Script

GML 3.0

XML Schema Definitions (XSD)

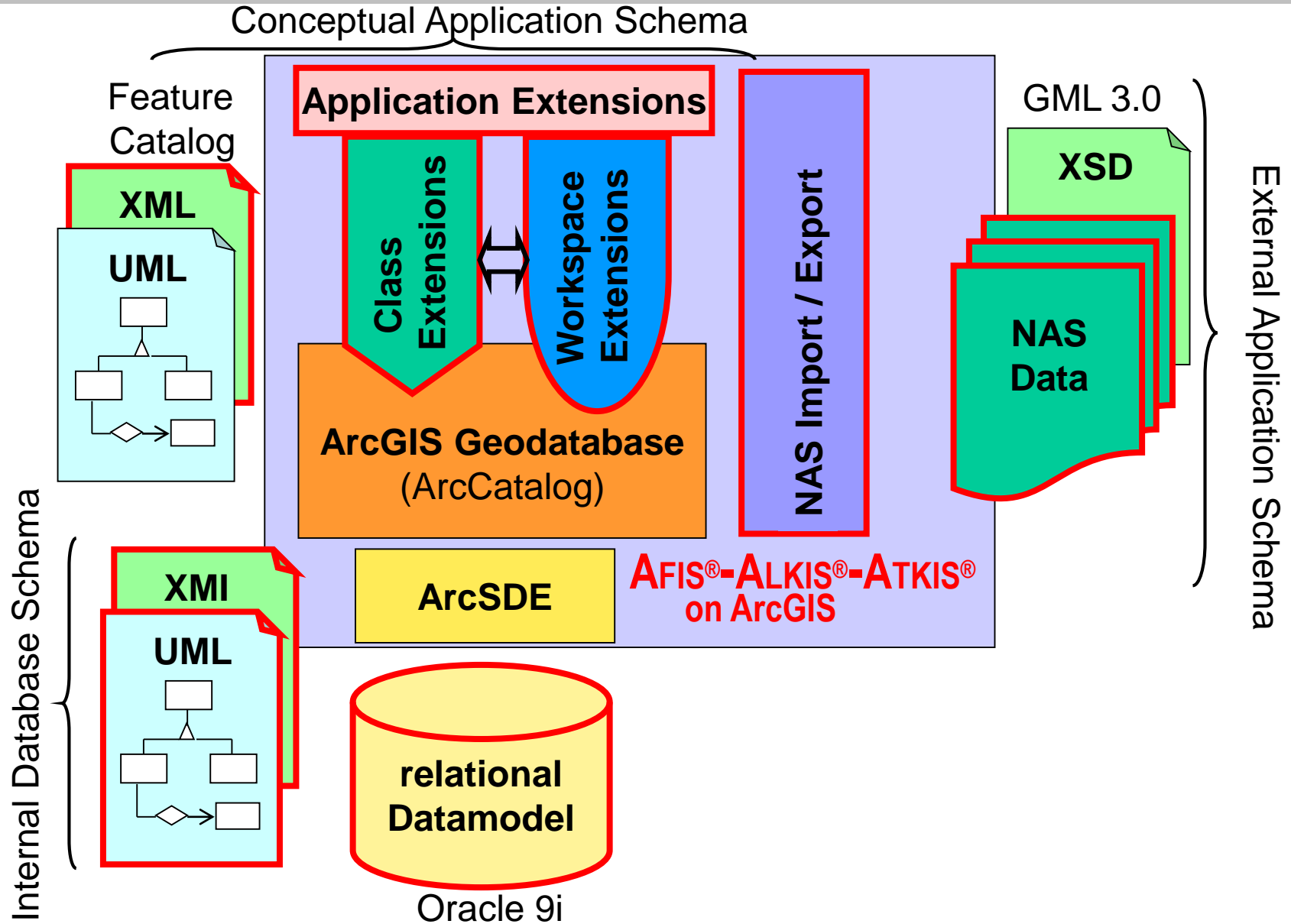
Standards-based Exchange Interface (NAS)

NAS Data

NAS Request Response

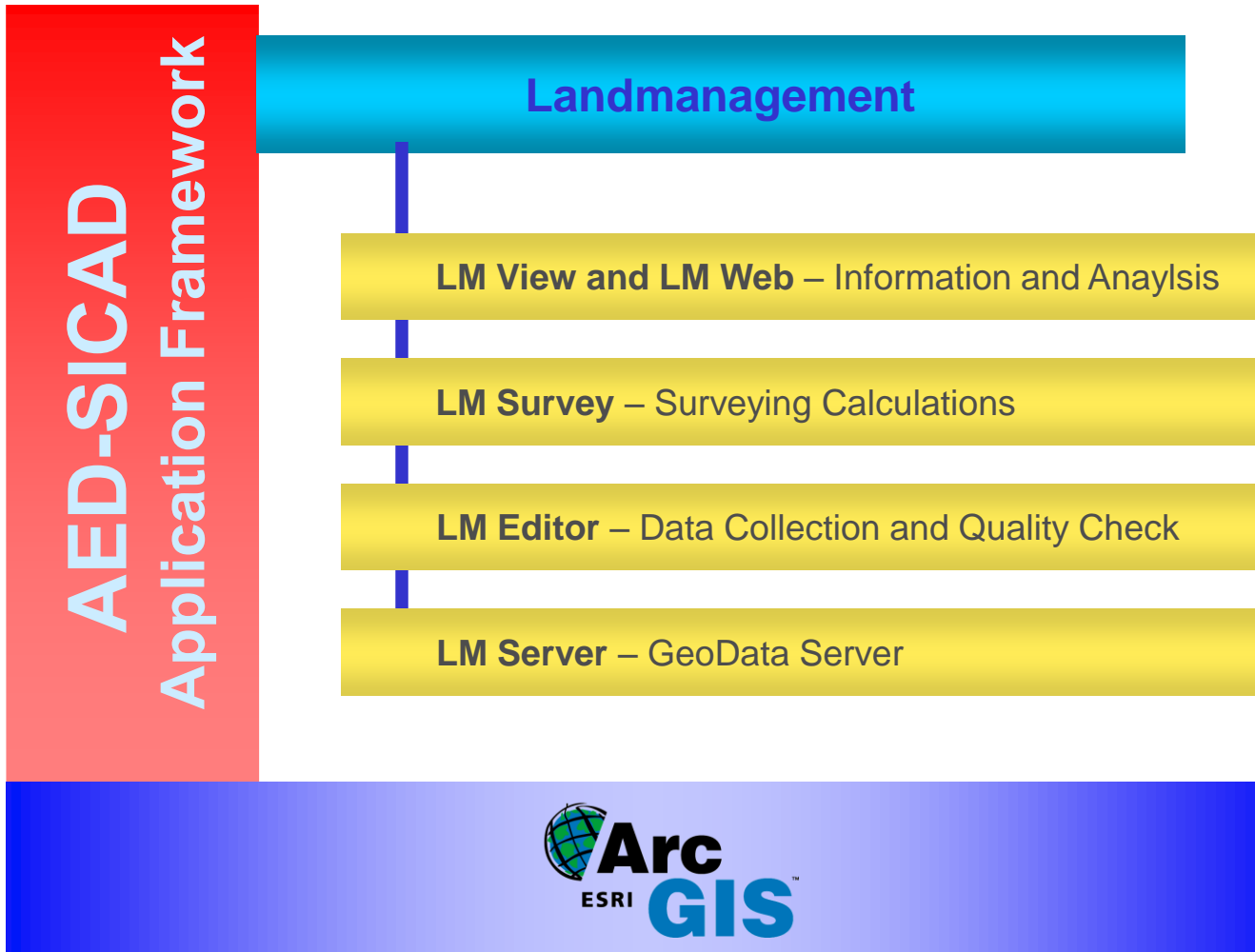
WFS 1.0 Filter Encoding 1.0

# 3-Schema Architecture of AED-SICAD Landmanagement on ArcGIS

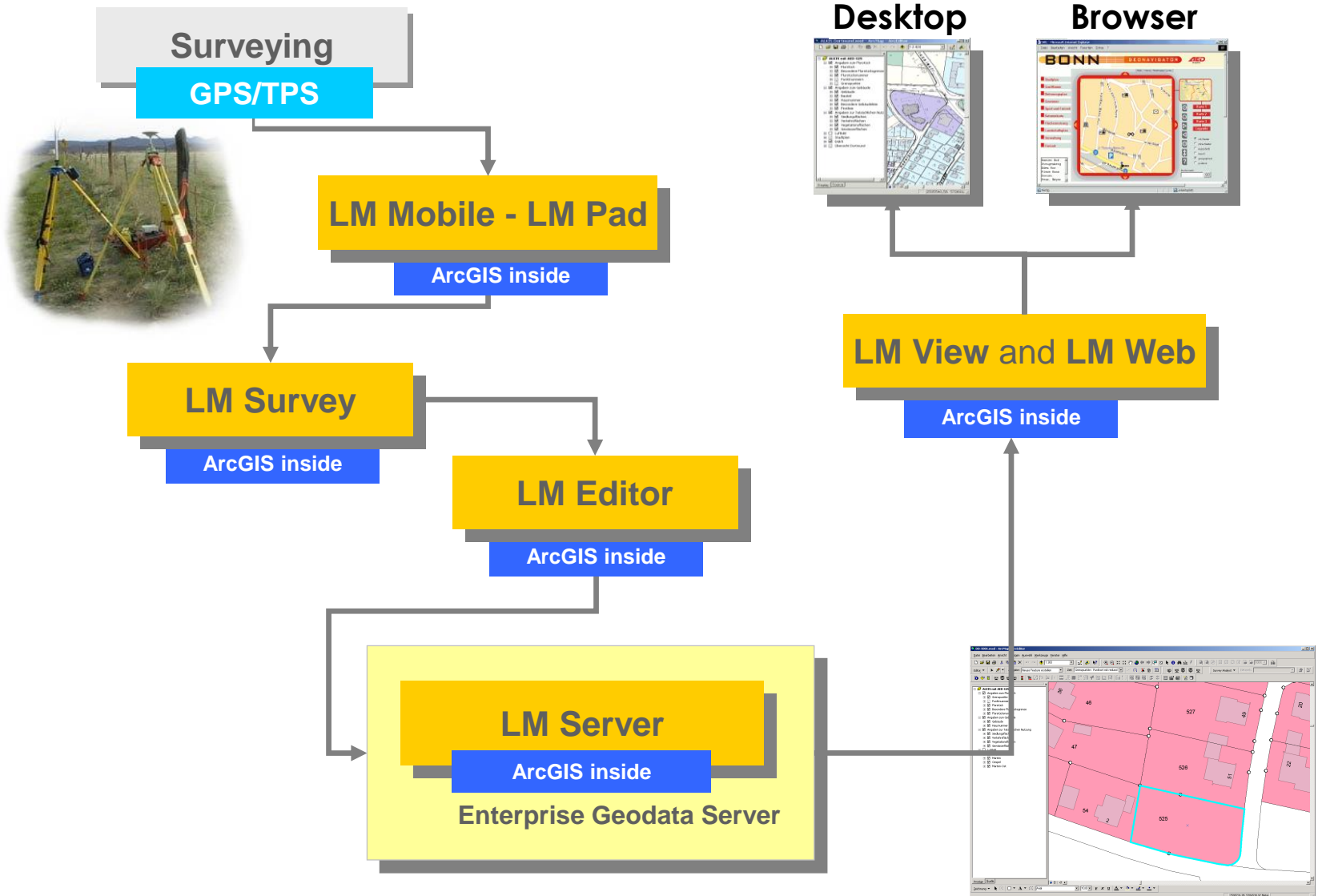




# Landmanagement Product Components



# Components for Workflows



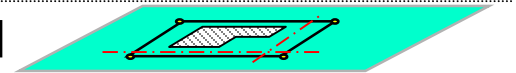
# Integration of Surveying and GIS



✦ Progressive Applications for Landmanagement from **AED and SICAD**

Cadastré

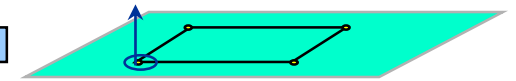
Cadastré Objects



✦ Latest GIS-Technology from **ESRI**

GIS

Standard Objects

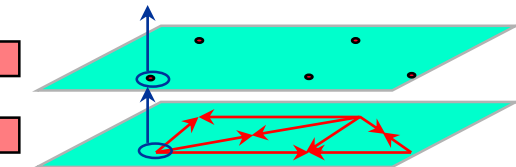


✦ Modern Technology for Field Survey from **Leica**

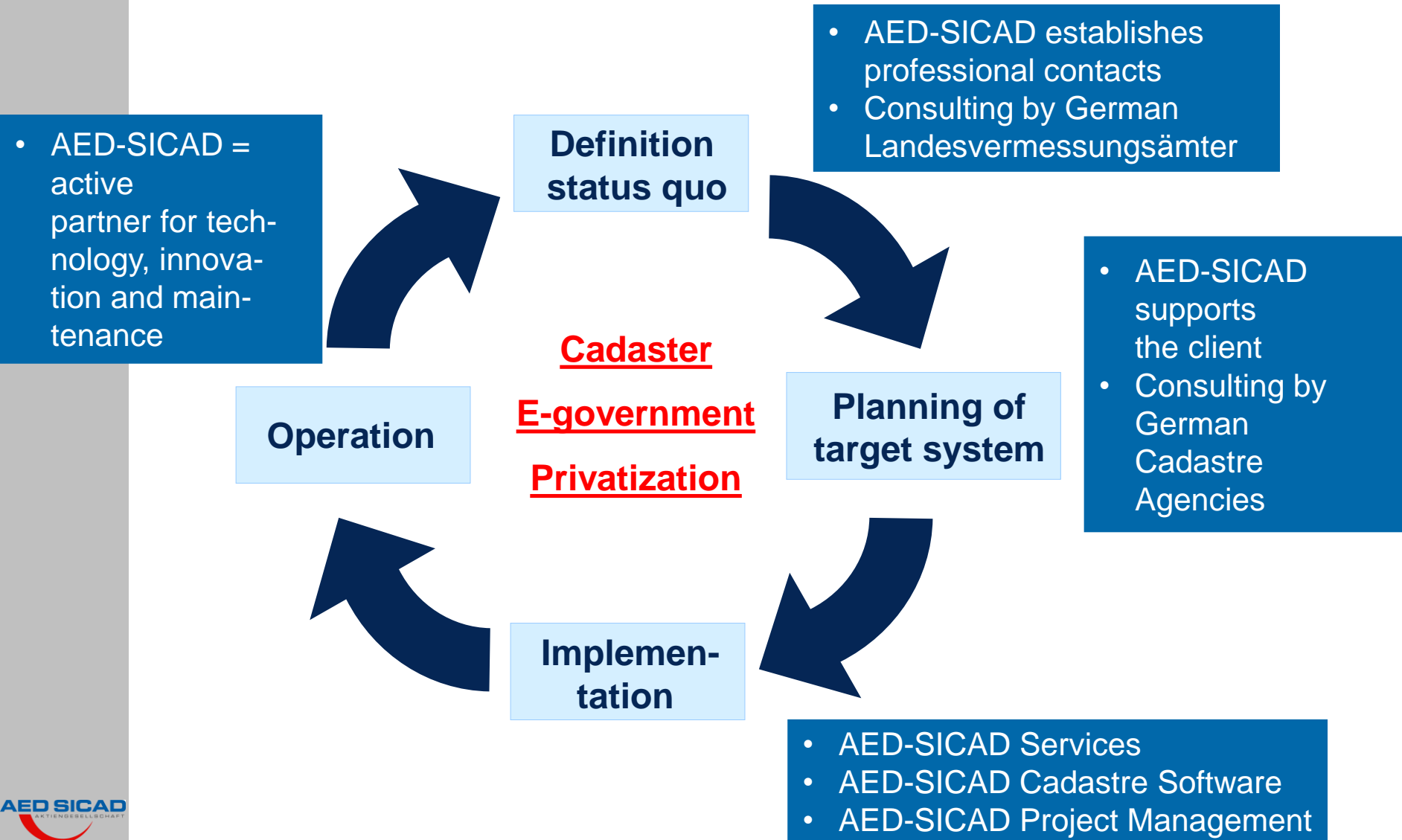
Surveying

Survey Points

Measurements



# The role of AED-SICAD in Cadastre Projects



# The Philosophy of Our GIS Applications

## ■ Process orientation

- ✦ As simple as possible
- ✦ Ergonomic
- ✦ Software adapts to the business processes

## ■ Interoperability

- ✦ Between GIS systems
- ✦ In the IT World

## ■ Continuous Data Flow

- ✦ From field to office and back

## ■ Investment security

- ✦ Smooth transition to new technologies
- ✦ Component-oriented architecture to reduce software license costs



**International Landmanagement Solution  
based on**

**ESRI ArcGIS Technology**

**ISO/OGC Standards**

**FIG Concept Cadastre 2014**

## Functional Components

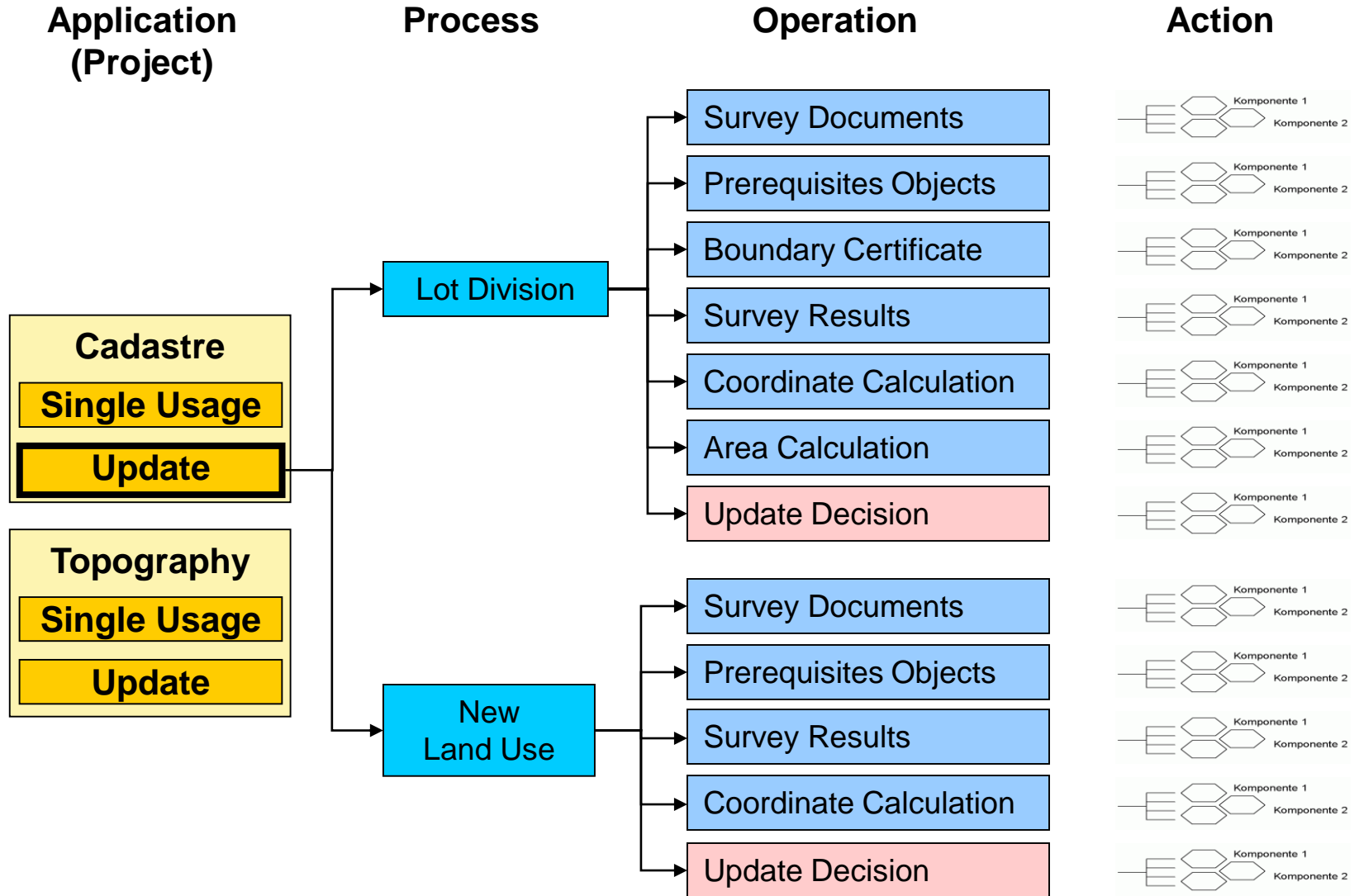
### ■ Some Functions

- ✦ Project Administration
- ✦ Workflow Management System
- ✦ Import Primary Data Set and Surveying Calculation
- ✦ Up-to-dateness Check and Quality Check including Database Simulation
- ✦ Processing Tools for customer-specific Update Processes
- ✦ Processing Tools for standard Update Cases
- ✦ Update Certificates
- ✦ Reporting Process
- ✦ Plausibility Check
- ✦ Export Interface (GML 3.0)
- ✦ ... and many more

### ■ Configurations for

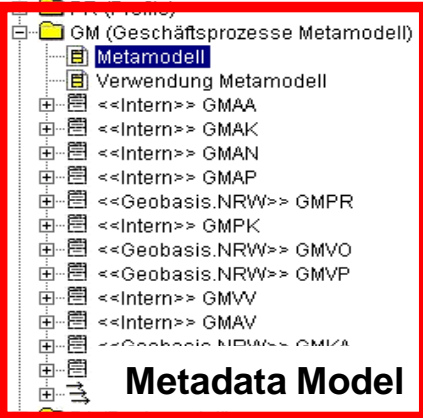
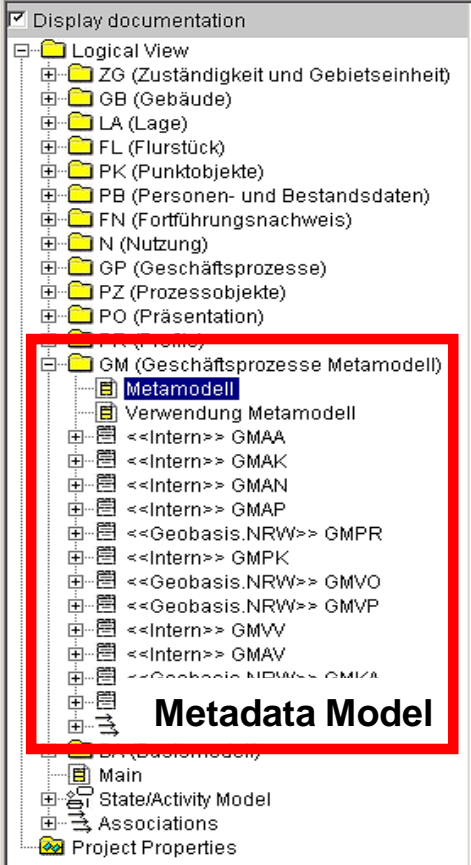
- ✦ Private Surveying Companies
- ✦ Cadastral Authorities
- ✦ Topography (basic functionality)

# Cadastral Workflows



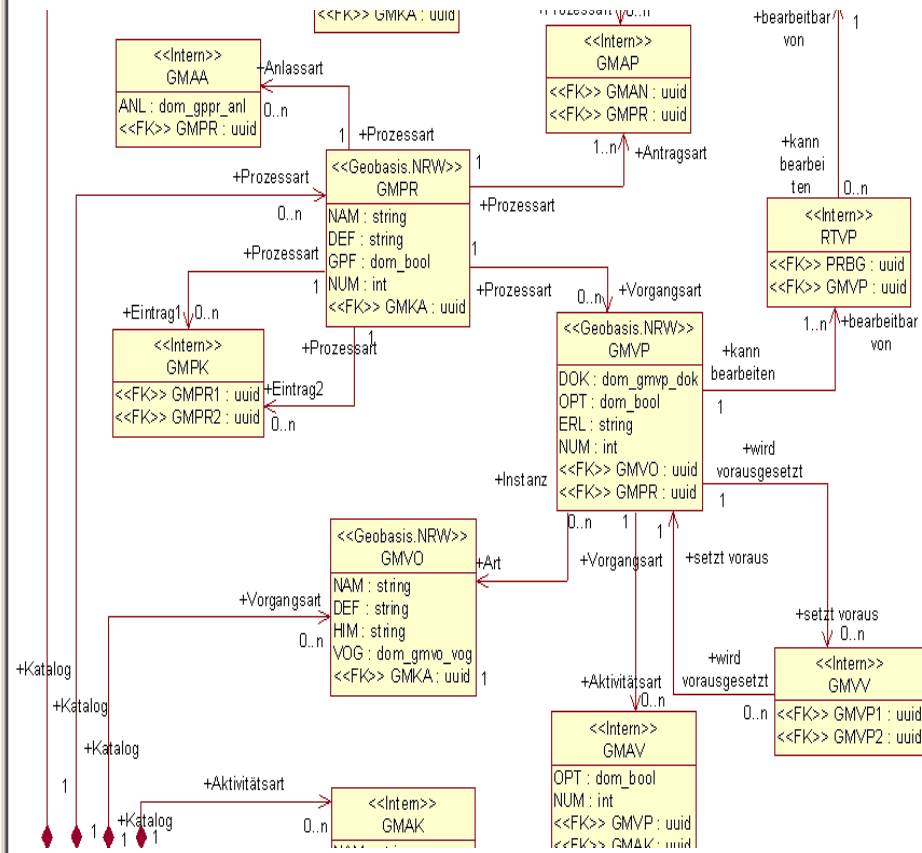


# Workflow Implementation within Landmanagement Solution



## AED-SICAD Metadata Model

- Basic Data Model
- Based on UML
- Flexible Customizing



# Workflow Illustration (1)

## Business Process

### ■ Lot Division

The screenshot shows the ALKIS-Portal interface. The left sidebar contains a tree view with the following structure:

- Anträge
  - C-6666
  - DO-5001
    - Zerlegung
      - Vermessungsschriften
      - Voraussetzung Objektbildung
      - Grenzniederschrift
      - Dokumentation der Vermessung
      - Koordinatenberechnung
      - Flurstücksflächenberechnung
      - Katasteramtliche Ergänzung
      - Fortführungsentscheidung
  - H-4711
  - H-4712
- Aufträge
- Verwaltung

The main content area displays three tables of process steps:

Formale Vorgänge	Bearbeiter	Status	offene Voraussetzungen
Vermessungsschriften	Jürgen Ebbinghaus	Erfolg	
Voraussetzung Objektbildung	Jürgen Ebbinghaus	Erfolg	

Katastertechnische Vorgänge	Bearbeiter	Status	offene Voraussetzungen
Grenzniederschrift	Jürgen Ebbinghaus	Erfolg	
Dokumentation der Vermessungsergebnisse	Jürgen Ebbinghaus	Erfolg	
Koordinatenberechnung	Jürgen Ebbinghaus	Erfolg	
Flurstücksflächenberechnung	Jürgen Ebbinghaus	Erfolg	

Fortführungsentscheidung	Bearbeiter	Status	offene Voraussetzungen
Fortführungsentscheidung	Jürgen Ebbinghaus	Erfolg	

The status bar at the bottom indicates: Status - Online, 20.05.2003, 16:34.

## Workflow Illustration (2)

### Operation

#### ■ Coordinate Calculation

→ Operation automatically starts ArcMap

The image shows two overlapping windows. On the left is a web application interface titled 'Vorgangsbearbeitung (Koordinatenberechnung)'. It features a list of activities with checkboxes and status indicators:

Aktivitäten	Status
Punktkenning bei Grenzpunkt belegt ?	Offen
Quasi-identische Punkte	Offen
Punktartenverwechslung	Offen
Punktkennzeichen reserviert ?	Offen
Ermittlung der Lageänderung	(opt) Offen
<b>Objektlage</b>	(opt) Offen

Below the list, 'Selektierte Aktivität:' is set to 'Offen'. There is a 'Bemerkungen' text area and a 'Meilensteinentscheidung:' set to 'Erfolg'. At the bottom, the user 'Jürgen Ebginghaus' is logged in, and there are buttons for 'Speichern' and 'Zurücksetzen'. The status bar shows 'Status - Online'.

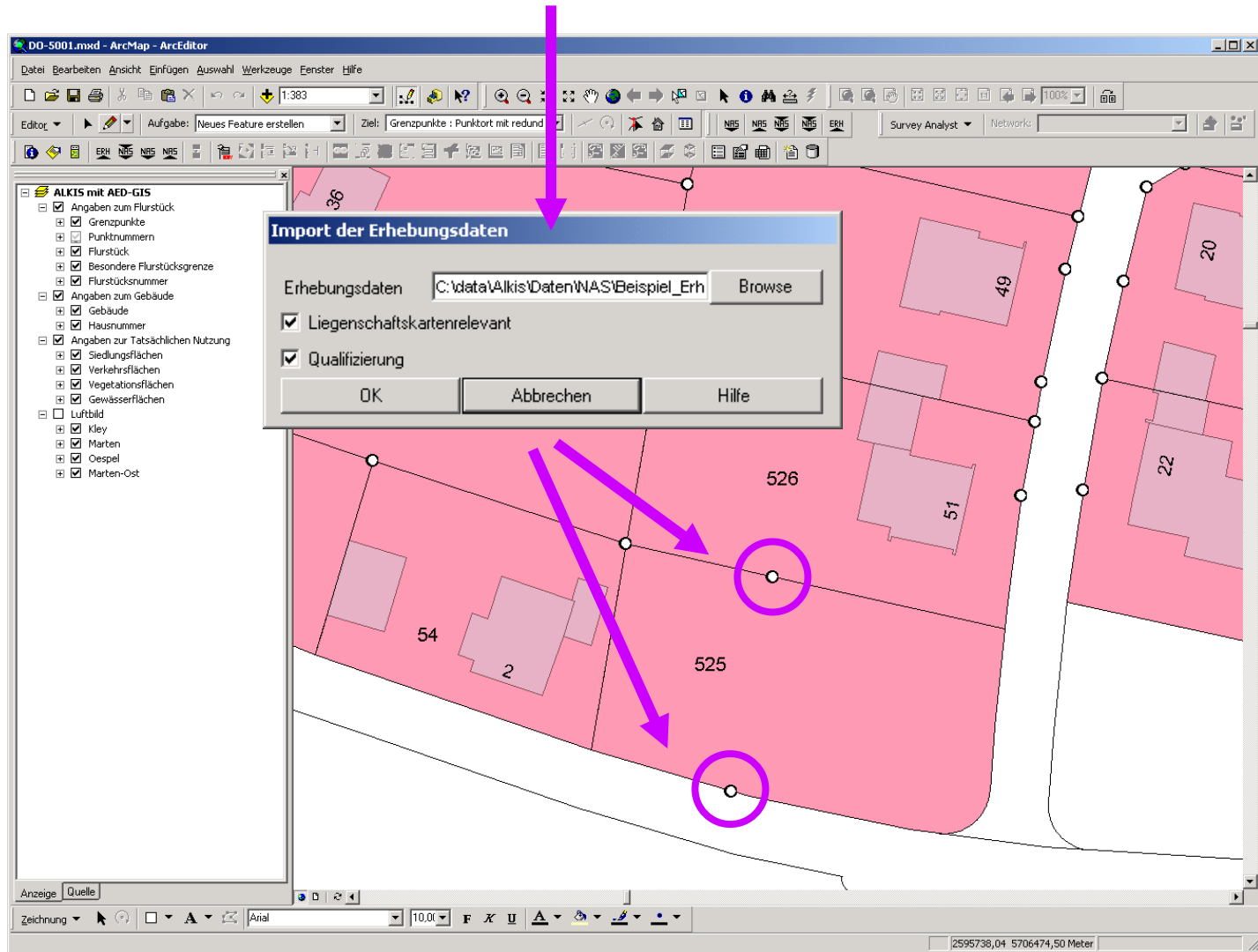
On the right is an ArcMap window titled 'DD-5001.mxd - ArcMap - ArcEditor'. The map displays a pink-shaded area with various features. The 'Table of Contents' on the left lists the following layers:

- ALKIS mit AED-GIS
  - Angaben zum Flurstück
    - Grenzpunkte
    - Punktnummern
    - Flurstück
    - Besondere Flurstücksgrenze
    - Flurstücknummer
  - Angaben zum Gebäude
    - Gebäude
    - Hausnummer
  - Angaben zur Tatsächlichen Nutzung
    - Siedlungsflächen
    - Verkehrsflächen
    - Vegetationsflächen
    - Gewässerflächen
  - Luftbild
    - Key
    - Marten
    - Osspel
    - Marten-Ost

The ArcMap window includes a standard toolbar and a status bar at the bottom showing coordinates and scale.

## Workflow Illustration (3)

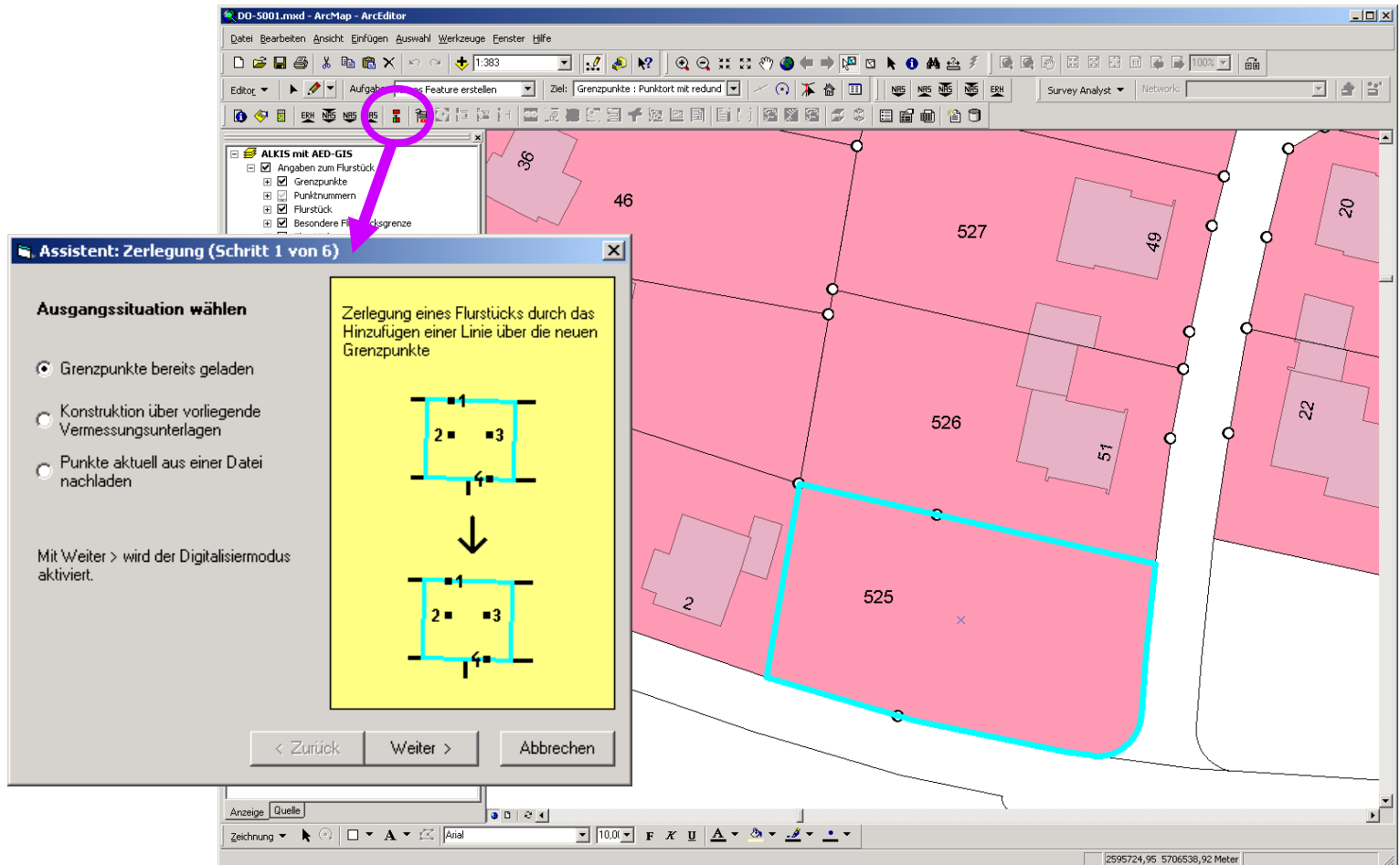
New Points must be digitized / imported



## Workflow Illustration (4)

### ■ Editing guided by Lot Division Wizard

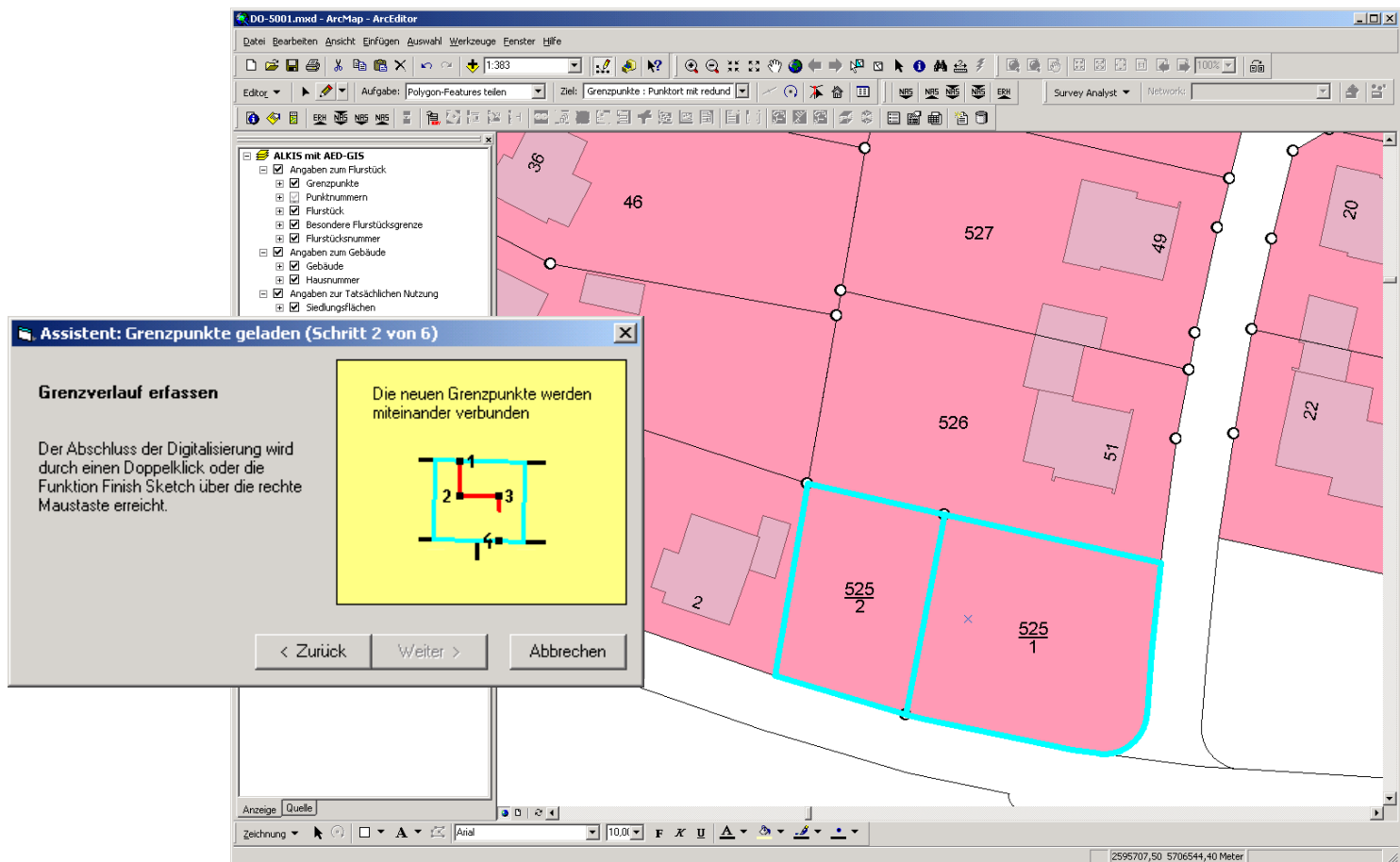
#### Step 1: Defining initial status



## Workflow Illustration (5)

### ■ Lot Division Wizard

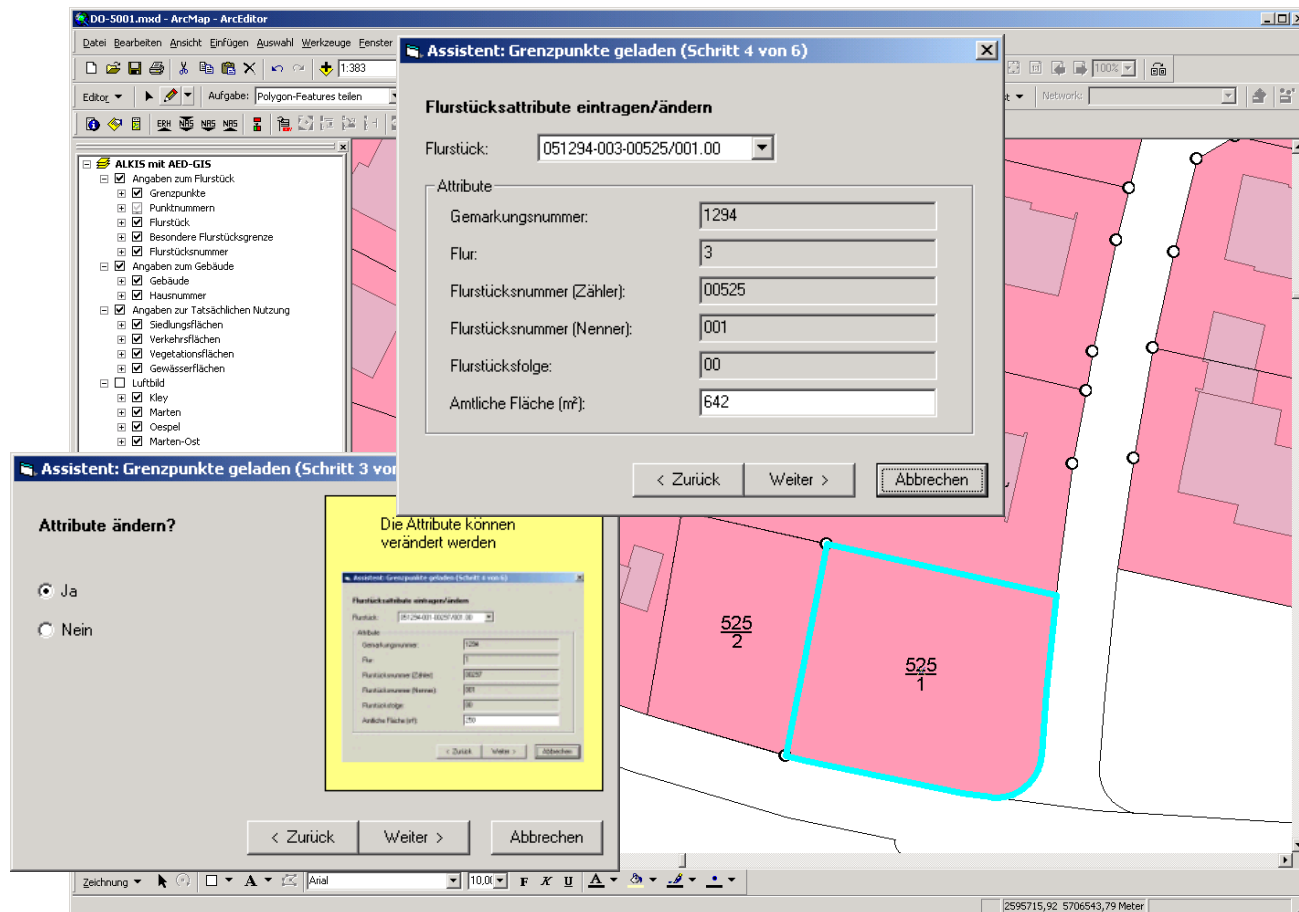
#### Step 2: Digitizing new boundary



# Workflow Illustration (6)

## ■ Lot Division Wizard

### Step 3/4: Changing lot attributes



# Workflow Illustration (7)

## ■ Lot Division Wizard

### Step 5/6: Positioning lot number

The screenshot shows the ArcMap interface with the Lot Division Wizard. The main map displays several pink lot boundaries. Two lots are labeled with their respective numbers:  $\frac{525}{2}$  and  $\frac{525}{1}$ . The wizard consists of two dialog boxes:

- Assistent: Grenzpunkte geladen (Schritt 5 von 6)**: This dialog asks "Flurstücksnummern positionieren?" (Position lot numbers?). It has two radio buttons: "Ja" (selected) and "Nein". Below the buttons, it states: "Bei Bestätigung der Frage aktivieren Sie den Verschiebemodus und Sie können eine Neupositionierung der Flurstücksnummern vornehmen." (Upon confirmation of the question, you activate the move mode and you can reposition the lot numbers.) To the right, a small diagram shows a lot with a red arrow pointing to a corner, indicating the move mode.
- Assistent: Grenzpunkte geladen (Schritt 6 von 6)**: This dialog is titled "Flurstücksnummern positionieren". It has a dropdown menu for "Flurstück:" with the value "051294-003-00525/001.00". Below this, it says: "Positionieren Sie den Cursor der Maus (Editorpfeil) auf die selektierte Flurstücksnummer." (Position the mouse cursor (editor arrow) on the selected lot number.) It also includes instructions: "Durch das Drücken der linken Maustaste aktivieren Sie den Verschiebemodus und können die Flurstücksnummer an die gewünschte Position verschieben." (By pressing the left mouse button, you activate the move mode and can move the lot number to the desired position.) A small diagram shows a lot with a red arrow pointing to a corner, indicating the move mode.

The ArcMap interface includes a menu bar (Datei, Bearbeiten, Ansicht, Einfügen, Auswahl, Werkzeuge, Fenster, Hilfe), a toolbar, and a status bar at the bottom showing the scale (10.0) and coordinates (2595723,02 5706539,43 Meter).



# Workflow Illustration (8)

## ■ Reporting on Processes and Activities

The screenshot shows the ArcMap/ArcEditor interface with a workflow reporting process. A purple circle highlights the reporting icon in the toolbar, with arrows pointing to the 'Meilensteine' (Milestones) table and the 'Protokoll' (Log) window.

**Meilensteine Table:**

GP - Vorgang	begonnen	letzte Änderung	am	Status	Bearbeiter	offene Vc
Zerlegung-Dokumentation der Vermessungsergebnisse	17.02.2003 13:50:32	17.02.2003 13:50:37		Erfolg	Jürgen Ebbinghaus	
Zerlegung-Flurstücksflächenberechnung	17.02.2003 14:00:35	17.02.2003 14:08:44		Erfolg	Jürgen Ebbinghaus	
Zerlegung-Fotführungsentscheidung	17.02.2003 14:08:50	17.02.2003 14:10:12		Erfolg	Jürgen Ebbinghaus	
Zerlegung-Grenzniederschritt	17.02.2003 13:50:21	17.02.2003 13:50:27		Erfolg	Jürgen Ebbinghaus	
Zerlegung-Katasteramtliche Ergänzung				Frei		
Zerlegung-Koordinatenberechnung	17.02.2003 13:57:29	17.02.2003 14:00:29		Erfolg	Jürgen Ebbinghaus	
Zerlegung-Vermessungsschiffen	17.02.2003 13:47:20	17.02.2003 13:47:53		Erfolg	Jürgen Ebbinghaus	
Zerlegung-Voraussetzung Objektbildung	17.02.2003 13:48:33	17.02.2003 13:50:12		Erfolg	Jürgen Ebbinghaus	

**Protokoll Window:**

```
$$$ Zerlegung Koordinatenberechnung 17.01.2003 Jürgen Ebbinghaus  
Zerlegung mit ALKIS-Assistent durchgeführt  
-----  
$$$ DO-5001 17.02.2003 Jürgen Ebbinghaus  
Definition des Antrags: 'DO-5001' durch Bearbeiter 'ebbinghaus'  
-----  
$$$ Zerlegung Flurstücksflächenberechnung 17.02.2003 Jürgen Ebbinghaus  
Zerlegung mit ALKIS-Assistent durchgeführt  
-----  
$$$ Zerlegung Koordinatenberechnung 20.05.2003 Jürgen Ebbinghaus  
Zerlegung mit ALKIS-Assistent durchgeführt  
-----
```

The 'Protokoll' window has a 'Schließen' (Close) button at the bottom right.

# Workflow Illustration (9)

## Operation

- Update Decision → Creating official update report (legal document)

**Stadt Dortmund**  
Vermessungs- und Katasteramt

**Gemeinde Dortmund**  
Gemarkung Oespel

**Fortführungsnachweis**

Nr. 1500/2002  
Fortführungsfalnummer 1

Dortmund, den 20.05.2003

*Ebbinghaus, Jürgen*

Eignungsfeststellung am 20.05.2003 durch Ebbinghaus, Jürgen  
Fortführungsmittelung abgegeben an  
Antragsteller am 20.05.2003 durch Ebbinghaus, Jürgen  
Eigentümer am 20.05.2003 durch Ebbinghaus, Jürgen  
Grundbuchamt am 20.05.2003 durch Ebbinghaus, Jürgen

Fortführungsnachweis		Stadt Dortmund Vermessungs- und Katasteramt	
Nr. 1500/2002		Gemarkung	Oespel
		Fortführungsfalnummer	1
		Seite	1
		Datum	20.05.2003
		Zahl der Fertigungen	1

Flurstückszerlegung			
Vor der Fortführung		Nach der Fortführung	
Flur	3	Flur	3
Flurstück	525	Flurstück	525/1
Antliche Fläche	1022 m <sup>2</sup>	Antliche Fläche	642 m <sup>2</sup>
Lage	Grummetweg	Lage	
Gesamtfläche	1022 m <sup>2</sup>	Flur	3
		Flurstück	525/2
		Antliche Fläche	382 m <sup>2</sup>
		Lage	Grummetweg
		Gesamtfläche	1024 m <sup>2</sup>

# Cartographical Generalization

## ■ Integrated in EDIT Component

- ★ Point Reduction
- ★ Simplification (Buildings)
- ★ Aggregation
- ★ Axis Calculation
- ★ Any Combinations



## ■ Link to external programs CHANGE and PUSH (ikg)

- ★ Integration of Functionality from Change and PUSH into EDIT Component

## Success Factors (1)

### ■ Integrated Product Family for all User Types

- ✦ Mobile Applications
- ✦ Surveying
- ✦ Editor
- ✦ Server
- ✦ Web, Viewing
- ✦ E-Commerce Interface

### ■ Based on ISO and OGC

- ✦ Complete Application Schema, Geometries, Topology is based on ISO Norms
- ✦ OGC WMS implemented
- ✦ OGC WFS (Including filter encoding) implemented
- ✦ OGC GML 3 implemented

## Success Factors (2)

- **Open and well documented Standard Interfaces**
  - ✦ Export Interface GML 3
  - ✦ Configurable Styles
- **Object oriented full history**
  - ✦ „What was the status of this lot on Nov 1, 2000?“
  - ✦ After 200 years cadastre experience, the German AdV has recognized that the juridical history of lots is absolutely necessary.
- **Fully Integrated Solution**
  - ✦ Alpha-numerical data (registry of persons, further parcel attributes) fully integrated with graphical data
  - ✦ Point data also fully integrated
  - ✦ Same GUI for all applications
- **Experience**
  - ✦ 20 years of AED-SICAD experience in Cadastre System development, implementation and management
  - ✦ German Cadastre may be the most advanced Cadastre system

## AED-SICAD - Some of our Land Management Customers

### ■ Federal States of Germany

- ✦ Baden-Württemberg
- ✦ Northrhine Westphalia
- ✦ Lower Saxony
- ✦ Sachsen-Anhalt
- ✦ Saxony
- ✦ Hamburg
- ✦ Berlin
- ✦ Saarland
- ✦ ... 80% market share in German Cadastre Market !

### ■ City of Luxembourg

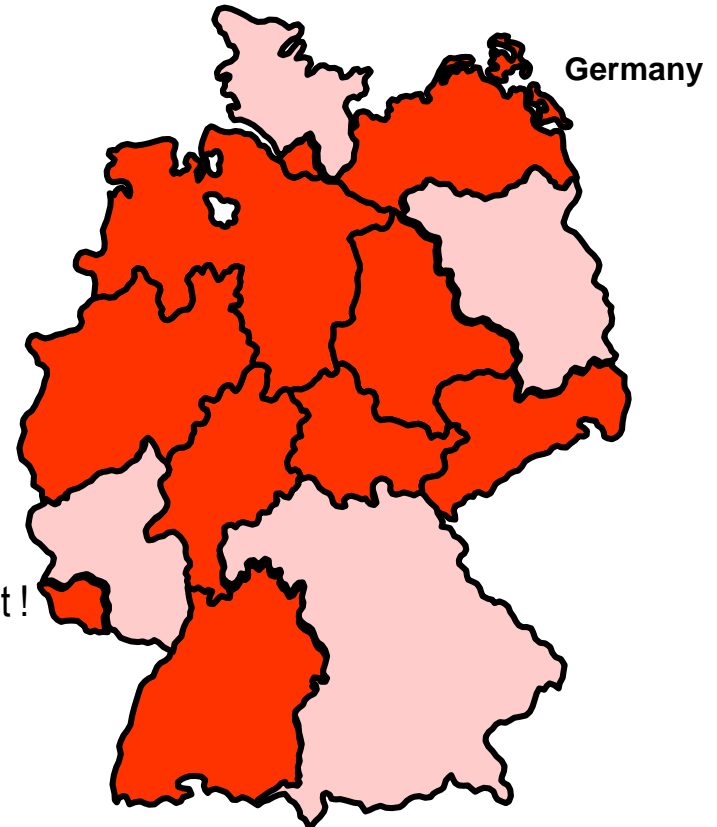
### ■ City of Namur


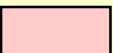
### ■ Shanghai

### ■ Tianjin

### ■ Singapore

### ■ And many more



SICAD at	
cadastral offices <b>and</b> municipal survey	
survey departments of municipalities	



**Contact:**

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Neubiberg/München  
Germany**